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Measurement of Exterior Sound Level of Trucks with Auxiliary Equipment — SAE J1077

SAE RECOMMENDED PRACTICE

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MEASUREMENT OF EXTERIOR SOUND LEVEL OF TRUCKS WITH AUXILIARY EQUIPMENT - SAE J1077

SAE Recommended Practice

Report of Vehicle Sound Level Committee
approved April 1975.

1. INTRODUCTION—This SAE Recommended Practice establishes the test procedures, environment, and instrumentation for determining the maximum exterior sound level of motor truck and truck-tractor combinations which are fitted with auxiliary equipment and are intended for highway operation. It is intended that the procedures are most applicable to vehicles having a gross vehicle weight rating (gvwr) greater than 4540 kg (10,000 lb).

2. DEFINITION—Auxiliary equipment is any device which is capable of generating noise on a motor truck or truck-tractor combination and is utilized to perform some task subsidiary to normal truck transportation functions.

3. INSTRUMENTATION—The following instrumentation shall be used, where applicable, for the measurement required:

3.1 A sound level meter which meets the Type 1 or S1A requirements of American National Standard Specification for Sound Level Meters, S1.4-1971

3.1.1 As an alternative to making direct measurements using a sound level meter, a microphone or sound level meter may be used with a magnetic tape recorder

and/or a graphic level recorder or indicating instrument, providing the system meets the requirements of SAE Recommended Practice J184, Qualifying A Sound Data Acquisition System. A sound level calibrator with an accuracy of ± 0.5 dB. (see paragraph 6.2.3)

3.3 A microphone windscreen may be used provided that its effect on the microphone response is not more than ± 1 dB for frequencies of 20-4000 Hz or $\pm 1\frac{1}{2}$ dB for frequencies of 4000 - 10,000 Hz.

3.4 An engine-speed tachometer having an accuracy of $\pm 1.5\%$ full scale.

3.5 An anemometer having an accuracy within 10% at 19 km/h (12 mph).

4. TEST SITES—The following test site requirements shall be considered the minimum necessary to perform effective measurements.

4.1 TEST SITE FOR MOVING PROCEDURE

4.1.1 A suitable test site shall consist of a level open space free of large reflecting surface, such as parked vehicles, signboards, buildings or hillsides, within 30 m (100 ft) of either the vehicle path or the microphone. See Fig. 1.

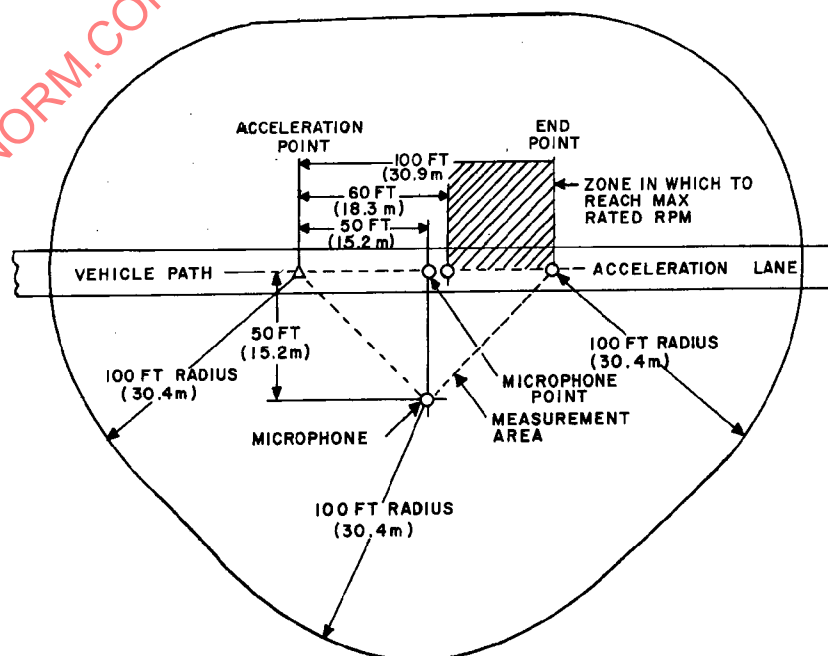


FIG. 1

4.1.2 The microphone shall be located 15m (50 ft) from the centerline of the vehicle path and 1.2 m (4 ft) above the ground plane. The normal to the vehicle path from the microphone shall establish the microphone point on the vehicle path.

4.1.3 An acceleration point shall be established on the vehicle path 15m (50 ft) before the microphone point.

4.1.4 An end point shall be established on the vehicle path 30 m (100 ft) from the acceleration point and 15 m (50 ft) from the microphone point.

4.1.5 The end zone is the last 12 m (40 ft) of vehicle path prior to the end point.

4.1.6 The measurement area shall be the triangular area formed by the acceleration point, the end point, and the microphone location.

4.1.7 The reference point on the vehicle to indicate when the vehicle is at any of the points on the vehicle path shall be the front of the vehicle except as follows:

4.1.7.1 If the horizontal distance from the front of the vehicle to the exhaust outlet is more than 6 m (20 ft),

test shall be run using both the front and rear of the vehicle as reference points.

4.1.7.2 If the engine is located rearward of the center of the chassis, the rear of the vehicle shall be used as the reference point.

4.1.8 The measurement area shall be surfaced with concrete, asphalt, or similar hard material, and shall be free of snow, grass, soil, ashes, or other sound-absorbing materials.

4.1.9 The vehicle path shall be relatively smooth, dry concrete or asphalt, free of extraneous material such as gravel.

4.2 TEST SITE FOR STATIONARY PROCEDURE

4.2.1 A suitable test site shall consist of a level open space free of large reflecting surfaces, such as parked vehicles, signboards, buildings, or hillsides, located within 30 m (100 ft) of either the vehicle or the microphone. See Fig. 2.

4.2.2 The microphone shall be located 1.2 m (4 ft) above the ground plane and 15 m (50 ft) from the nearest major vehicle surface as shown in Fig. 2. Four locations are thus defined.

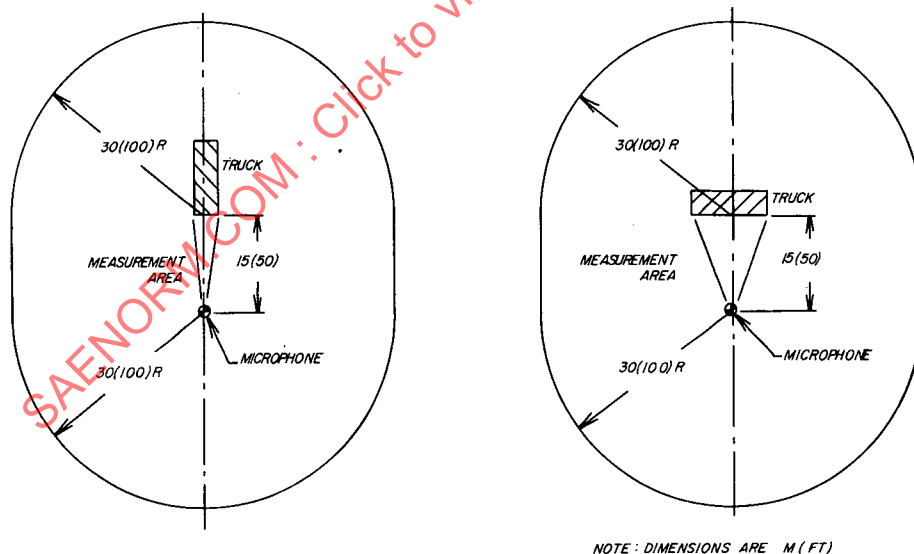


FIG. 2 - TEST SITE FOR STATIONARY TEST PROCEDURE
(SEE PARAGRAPH 4.2)

4.2.3 The measurement area shall be surfaced with concrete, asphalt, or similar hard material. and shall be free of snow, grass, soil, ashes, or other sound-absorbing materials.

5. PROCEDURE-The vehicle shall be tested by both procedures listed below unless the auxiliary equipment will be operated in only one vehicle operating mode (stationary or moving) in which case only the applicable procedure shall be followed.

5.1 MOVING TEST PROCEDURE

5.1.1 Vehicle Operation-Full throttle acceleration and closed throttle deceleration test are to be used. A beginning engine speed and proper gear ratio must be determined for use during measurements.

5.1.2 Select the highest rear axle and/or transmission gear ("highest gear" is used in the usual sense and is synonymous with the lowest numerical ratio) and an initial vehicle speed such that at wide-open throttle, the vehicle will accelerate from the acceleration point:

- a. Starting at no more than two-thirds of maximum rated or full-load governed engine speed.
- b. Reaching maximum rated or full-load governed engine speed within the end zone.
- c. Without exceeding 55 km/h (35 mph) before reaching the end point.

5.1.2.1 Should maximum rated or governed engine speed be attained before reaching the end zone, decrease the engine speed in 100 rpm increments until maximum rated or governed speed is attained within the end zone.

5.1.2.2 Should maximum rated or governed engine speed not be attained until beyond the end zone, select the next lower gear until maximum rated or governed speed is attained within the end zone.

5.1.2.3 Should the lowest gear still result in reaching maximum rated or governed speed beyond the permissible end zone, unload the vehicle and/or increase the engine speed in 100 rpm increments until the maximum rated or governed speed is reached within the end zone.

5.1.3 For the acceleration test, approach the acceleration point using the engine speed and gear ratio selected in paragraph 5.1.2 and at the acceleration point, rapidly establish wide-open throttle. The vehicle reference shall be as indicated in paragraph 4.1.7. Acceleration shall continue until maximum rated

or full-load governed engine speed is reached.

5.1.4 Wheel slip which affects maximum sound level must be avoided.

5.1.5 For the deceleration test, approach the microphone point at maximum rated or full-load governed engine speed in the gear selected for the acceleration test. At the microphone point, rapidly close the throttle and allow the vehicle to decelerate to one-half of maximum rated or governed engine speed. The vehicle reference shall be indicated in paragraph 4.1.7. If the vehicle is equipped with an exhaust brake, this deceleration test is to be repeated with the brake full on immediately following closing of the throttle.

5.1.6 During the moving test, the auxiliary equipment shall be operated within the manufacturers recommendations such that the maximum sound levels are produced.

5.2 MEASUREMENTS FOR MOVING PROCEDURE

5.2.1 The sound level meter shall be set for fast response and the A-weighting network.

5.2.2 The meter shall be observed during the period while the vehicle is accelerating or decelerating. The applicable reading shall be the highest sound level obtained for the run, ignoring unrelated peaks due to extraneous ambient noise. Readings shall be taken on both sides of the vehicle.

5.2.3 The sound level for each side of the vehicle shall be the average of the two highest readings which are within 2 dB of each other. Report the sound level for the side of the vehicle with the highest readings.

5.3 STATIONARY TEST PROCEDURE

5.3.1 If the auxiliary equipment can be operated while the vehicle is stationary, the vehicle shall be positioned with respect to the microphone as shown in Fig. 2.

5.3.2 The auxiliary equipment shall be operated through two complete cycles of operation, while observing the sound level meter. This test shall be repeated with the microphone at each of the 4 positions determined in paragraph 4.2.2. The auxiliary equipment shall be operated in the mode that will generate the highest sound levels without exceeding the manufacturers operating specifications.

5.4 MEASUREMENTS FOR STATIONARY PROCEDURE